Evaluating layer-by-layer structures of different graphene/metal and graphene/metal oxide as electrodes for supercapacitors

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Graphene growth by chemical vapor deposition is the most promising technology in terms of large scale synthesis, film continuity and uniformity of graphene films. In the present work we evaluate the performance of graphene/metal and graphene/metal oxide layered structures as potential electrodes in supercapacitor applications. In addition to their outstanding properties such as high electrical conductivity, chemical stability and large specific surface area, graphene films are ideal candidates to be used in transparent and flexible energy storage devices. Single and layer-by-layer graphene stackings have been fabricated combining graphene transfer techniques and magnetron sputtering. The electrochemical properties of the samples were analyzed using a Swagelok cell and organic (1 M $LiClO_4$ dissolved in ethylene carbonate (EC) and diethyl carbonate (DEC) mixed in 1:1 volumetric proportions) and aqueous (1 M $NaSO_4$ solution) electrolytes. The results suggest an improvement in the performance of the device with an increase in the number of graphene layers. Furhtermore, the deposition of different transition metal oxides between the graphene layers stacking further improves the areal capacitance of the device up to 10 mF/cm^2.

Keywords: Graphene electrodes, flat films, supercapacitors, CVD, metal oxide

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